

any evidence of mosaic transmission. The budding in 1951 was done in early August, and as soon as the bud had set, the branch above the bud was cut back, to force the growth of the bud. Thus it was possible to get several months growth of the normal branch. The buds inserted in 1950 made a complete season's growth without showing any evidence of mosaic.

The symptoms of these abnormal silver maples certainly suggest virus infection, but the failure to transmit the mosaic by either budding or grafting, and the fact that at least two different mosaic types of segregates were among the progeny of a single tree, throw some doubt on the virus origin of these variants. In the case of prunus virus (3), however, the virus transmission by grafting requires two full seasons of growth (4). It is possible that these aberrant seedlings had a virus which was slow to develop symptoms when transmitted to a normal host.

Blakeslee (5) has found a mutation in *Datura* which resembles the effect of a virus disease. Both the virus infected and the mutant type showed modified leaves, capsules and flowers. In view of the failure to transmit the mosaic by budding or grafting, and the segregation of four distinct types of progeny from a single parental tree, it appears that the aberrant silver maples described are of genetic origin.

Recently John and Wilson (6) have described a somewhat similar genetically conditioned leaf character in the cucumber, *Cucumis sativus* L. They found what was termed a "ginkgo leaf" variation to be inherited as a simple Mendelian recessive factor. No variation in degree of expression such as observed in the *Acer* mutants was reported.

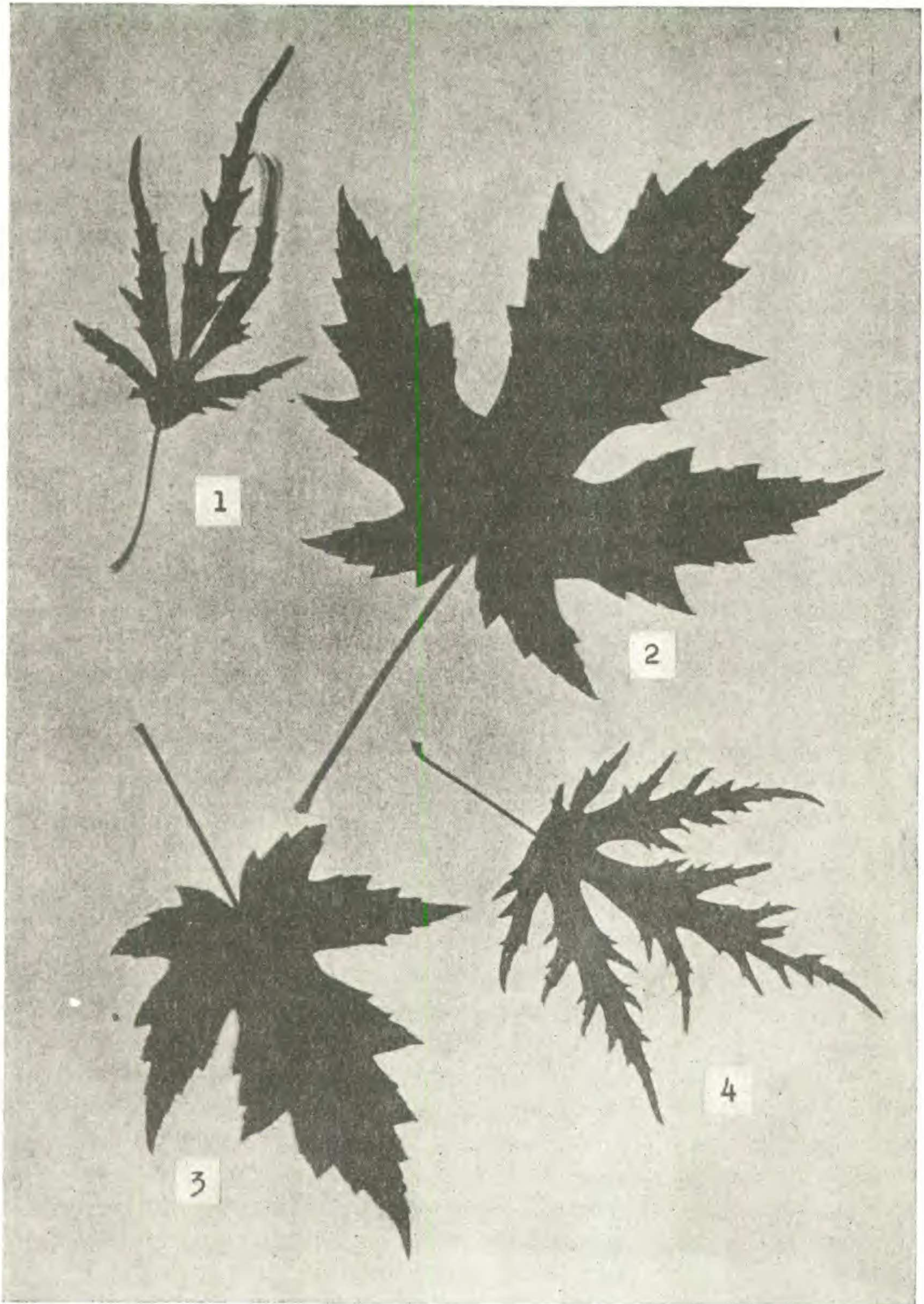
LITERATURE CITED

1. SCHWERIN, F. G. Die Varietäten der Gattung Acer. Paul Parey, Berlin. 1893.
2. REHDER, A. Manuel of cultivated trees and shrubs. Macmillan Co. New York. 1940.
3. ANONYMOUS. Weeping Silver Maple. American Nurseryman, 68(8): 13. 1938.
4. SMITH, K. Plant Virus Diseases. J. & A. Churchill, Ltd. London. 1937.
5. BLAKESLEE, A. F. Growth patterns in plants. Growth Symposium. 1941.
6. JOHN, C. A. & WILSON, J. D. A "ginkgo leafed" mutation in the cucumber. Jour. Hered., 43: 47-48. 1952.

DESCRIPTION OF PLATE

Typical leaves of silver maple segregates from a single parental tree.

1. Leaf of extreme variant similar to those of a variant described by the Willis Nursery Co. The leaves have extremely narrow lobes and have chlorophyll deficiencies characteristic of a virus infection.
2. Leaf of a normal segregate.
3. Leaf of a segregate with small leaves similar to those of "Wierii." These leaves show little or no mosaic characteristics.
4. Leaf of a segregate resembling "Skinners" silver maple. Chlorophyll aberrations resemble those caused by mosaic virus.



PAULEY AND JOHNSON, ABERRANT SILVER MAPLES

JOURNAL
OF THE
ARNOLD ARBORETUM

VOL. XXXIII

OCTOBER 1952

NUMBER 4

STUDIES IN THE BORAGINACEAE, XXIII
A SURVEY OF THE GENUS LITHOSPERMUM

IVAN M. JOHNSTON

With three plates

SOME MONTHS AGO I began a study of the genus *Arnebia* for the purpose of determining whether or not the eastern Asiatic species *A. Hancockiana* (Oliver) Johnston had been properly assigned to that genus. As the study progressed questions arose as to precisely how *Arnebia* could be distinguished from *Lithospermum*. As a basis for the solution of this problem dissections were made of representative species of *Lithospermum*. This gave me reasons for doubting the naturalness of that genus as currently defined. Methodical study of all the species of *Lithospermum* was then commenced, and the investigation eventually extended to members of other obviously related genera. From an examination of a few Asiatic species my study has gradually widened into a critical re-examination and redefinition of *Lithospermum* and all the other genera of the Lithospermeae characterized by coarsely bracted inflorescence.

The present paper is concerned only with *Lithospermum*. The species of the genus are enumerated, their principal synonymy given, and a key for their identification provided. My chief concern, however, has not been with the details of species-classification, but rather with the over-all composition of the genus, and in its units only so far as they reveal morphological traits pertinent to the definition of the genus and the major grouping of its species. The observations given concerning the species are primarily those significant in establishing the relationship and the precise position of the species in a natural classification. They are mostly concerned with the inner structures of the corolla, for the most part described only imperfectly, if not completely ignored, by previous writers. The related genera will be given similar treatment in the next paper of this series. Their relationships with *Lithospermum* will there be discussed at length, and new generic descriptions, keys, and tabular synopses useful in evaluating and distinguishing them will be provided.

As here treated *Lithospermum* includes *Arnebia* and *Macrotomia*, but excludes *Lithodora*, *Moltkia* and *Stenosolenium*, as well as *Lithospermum*